CLAIMS:

1. A hand wheel actuator comprising:

a housing;

a first shaft having an upper end configured for attaching a hand wheel, said first shaft being supported by said housing via bearings such that it is rotatable about its own axis;

a position sensor for detecting an angular displacement of the first shaft from a selected origin and producing a signal indicative of said angular displacement;

an electric motor in operative communication with the first shaft for providing force feedback to a driver; and

a steering post maintained in a fixed position with respect to the housing for maintaining a hub in a fixed position centrally of said hand wheel, said hub facing the driver when said hand wheel is operated, said steering post extending along an axis of rotation of said hand wheel and through said first shaft, said first shaft being fixed to said hand wheel and rotating therewith.

2. The hand wheel actuator of claim 1, said hub including electronic instruments and switches, said post being hollow and serving as a conduit for an instrument cable extending to said instruments and switches.

3. The hand wheel actuator of claim 1, said steering post being attached and fixed directly to said housing.

4. The hand wheel actuator of claim 1, said steering post being attached directly to a post support which is fixed to said housing.

5. The hand wheel actuator of claim 3 wherein said first shaft includes a lower section having an increased diameter and an internal gear, said internal gear being engaged to a pinion mounted to an upper shaft; said post support extending between said internal gear and said pinion for supporting and maintaining said post in a fixed position with respect to said housing.

6. The hand wheel actuator of claim 1, said first shaft being supported by said steering post via said bearings which allow relative rotation between said steering post and said first shaft.

7. The hand wheel actuator of claim 6 further comprising:

an arm extending from said first shaft to a steering shaft, said steering shaft and said first shaft being coaxial and said arm being fixed and connecting said steering shaft with said first shaft; said position sensor directly sensing a position of said steering shaft.

8. The hand wheel actuator of claim 7 wherein said steering shaft comprises an upper shaft and a lower shaft, said upper shaft and said lower shaft being coupled by a torsion bar and said position sensor is a torque/position sensor, said torque/position sensor utilizing a displacement between said upper shaft and said lower shaft to determine a torque on said steering shaft, said motor being operatively connected to said lower shaft.

9. The hand wheel actuator of claim 7 further comprising a return-to-center device operatively connected to said steering shaft, said return-to-center device applying a mechanical force to said steering shaft when said hand wheel is not in a centered position, said mechanical force biasing said hand wheel toward said centered position.

10. The hand wheel actuator of claim 6, said first shaft being in mechanical communication with a steering shaft, said position sensor directly sensing a position of the steering shaft.

11. The hand wheel actuator of claim 10 wherein said first shaft has a first gear and said steering shaft has a second gear, said first gear and said second gear being in operative communication with each other such that rotation of one of said first gear and said second gear causes a corresponding rotation of another of said first gear and said second gear.

12. The hand wheel actuator of claim 11 wherein said first gear is a conical gear and said second gear is a conical gear.

13. The hand wheel actuator of claim 12 wherein said first gear and said second gear have substantially coincident axes of rotation.

14. The hand wheel actuator of claim 11 wherein said first gear and said second gear engage each other and have parallel axes of rotation.

15. The hand wheel actuator of claim 10 wherein said first shaft has a first pulley and said steering shaft has a second pulley, said hand wheel actuator further comprising a belt that engages said first pulley and said second pulley thereby placing said steering shaft and said first shaft in operative communication with each other.

16. The hand wheel actuator of claim 10 wherein said steering shaft comprises an upper shaft and a lower shaft, said upper shaft and said lower shaft being coupled by a torsion bar and said position sensor is a torque/position sensor, said torque/position sensor utilizing a displacement between said upper shaft and said lower shaft to determine a torque on said steering shaft, said motor being operatively connected to said lower shaft.

17. The hand wheel actuator of claim 16 further comprising a redundant position sensor directly sensing a position of said first shaft.

18. The hand wheel actuator of claim 10 further comprising a mechanical return-to-center and positive stop device that positively limits rotation of said hand wheel to a selected maximum angle or rotation in either direction and provides a mechanical force to said steering shaft when said hand wheel is not in a centered position, said mechanical force biasing said hand wheel toward said centered position.

19. The hand wheel actuator of claim 18 wherein said mechanical return-to-center and positive stop device acts directly on said steering shaft.

20. The hand wheel actuator of claim 18 wherein said mechanical return-to-center and positive stop device comprises a ball screw and spring mechanism.

21. The hand wheel actuator of claim 18 wherein said mechanical return-to-center and positive stop device comprises a spring-biased cam and camming surface linked to said steering shaft.

22. The hand wheel actuator of claim 1 wherein said first shaft is supported by said housing via said bearings which allow rotation of the first shaft with respect to said housing; said post extending through said first shaft to maintain said hub in said fixed position.

23. The hand wheel actuator of claim 22, said first shaft being in mechanical communication with a steering shaft, said position sensor directly sensing a position of the steering shaft.

24. The hand wheel actuator of claim 23 wherein said first shaft has a first pulley and said steering shaft has a second pulley, said hand wheel actuator further comprising a belt that engages said first pulley and said second pulley thereby placing said steering shaft and said first shaft in operative communication with each other.

25. The hand wheel actuator of claim 10 wherein said steering shaft comprises an upper shaft and a lower shaft, said upper shaft and said lower shaft being coupled by a torsion bar; said position sensor being a torque/position sensor that utilizes a displacement between said upper shaft and said lower shaft to determine a torque on said steering shaft, said motor being operatively connected to said lower shaft.

26. The hand wheel actuator of claim 24 further comprising a redundant position sensor directly sensing a position of said first shaft.

27. The hand wheel actuator of claim 23 further comprising a redundant position sensor directly sensing a position of said first shaft.

28. The hand wheel actuator of claim 23 further comprising a mechanical return-to-center and positive stop device that positively limits rotation of said hand wheel to a selected maximum angle or rotation in either direction and provides a mechanical force to said steering shaft when said hand wheel is not in a centered position, said mechanical force biasing said hand wheel toward said centered position.

29. The hand wheel actuator of claim 18 wherein said mechanical return-to-center and positive stop device comprises a spring-biased cam and camming surface linked to said steering shaft.